

CSI-THERMAL PROGRAM INSTALLATION INSPECTION CHECKLIST							
Customer Name:		Address:		Installation Contractor:			
Project Type (circle): Single Family Multi-Family/Commercial				Project ID:			
Initial Inspection Date:		Initial RESULTS (circle): PASS FAIL		Inspector: Signature:			
Re-inspection Date:		Re-Inspection RESULTS (circle): PASS FAIL		Inspector: Signature:			
CSI-Thermal Program Inspection Checklist is based on the Solar Rating and Certification (SRCC) Operating Guidelines (OG) 300, as referenced in column A. The SRCC comments are noted in the explanation column using this same font. Comments written in <i>Italics</i> represent explanations from the CSI-Thermal Program Administrators.							
FAILURE ITEMS							
Inspection Item		Explanation		Inspection Findings		Pass or Fail	
System Operation		Is the system operational? Are there any significant health/safety violations?					
Consistent with ICF		<u>Single-Family Only:</u> Is the installed system the same as reported on the ICF?		Back up Fuel Source (circle): Natural Gas Electricity # of Tanks (circle): 1 2 1 with tankless backup Additional Comments:			
Collector		The collector model and size must be consistent with the ICF and with SRCC label.		Number of collectors: Total square feet of collector area: Manufacturer: Model: Collector information consistent with ICF?:			
SOF		The ideal SOF is a value of 1.0, which is achieved by mounting the SWH collector(s) facing due south and tilted at latitude of the project site. The minimum SOF permitted to receive a CSI-Thermal Program incentive is 0.75. Collectors positioned outside of the ideal range will receive a SOF between 0.75 and 1.0 as defined in Appendix C in the Handbook. Tilt must be within ± 3° of tilt on ICF and azimuth must be within ± 5° of azimuth on ICF.		Tilt: True Azimuth: SOF: SOF within allowable parameters? SOF consistent with ICF?			
Collector Flow Rate		In multiple collectors arrays the instantaneous flow rate variation between collectors shall not exceed10% of the array average flow. When an array of collectors is connected by manifolds to form a parallel flow configuration, provision shall be incorporated in the manifold and/or collectors to maintain the proper design flow rate of the heat transfer fluid through each collector.					
Collector Flow Balance		<u>For Multi-Family/Commercial Only:</u> Ensure proper flow balancing in and among collector banks by using reverse return plumbing, flow balancing valves and adhering to manufacturer's maximum collectors allowed in banks.		Does the number of collectors in series match that input into the online calculator output?			
Collector Circulation Control		The collector subsystem control shall be designed to be compatible with control requirements of the system.					
Version Updated on 7/17/2012				Single-family			

Solar Tank	<p>For Single-Family: Both pressurized and non-pressurized tanks shall meet the requirements set by a nationally accepted standard setting organization. Non-pressurized tanks shall be vented to atmospheric pressure. Non-fiberglass hot water storage tanks shall comply with ASME Boiler and Pressure vessel Code, Division 1, Section vii, "Rules for Construction of Pressure Vessels" unless they fall into one of the classes of vessels exempted in Part u-1c. Fiber-reinforced plastic pressure vessels shall comply with ASME Boiler and Pressure Vessel Code, Section X, "Fiber-Reinforced Plastic Pressure Vessels" unless they fall into one of the classes of vessels exempted in Part RG-121. Gas water heaters shall comply with ANSI Z21.10.1-2004?CSA 4.1-2004 'Gas Water Heaters Volume 1, Storage Water Heaters With Input21.10.3 -2004?CSA 4.3_2004' Gas Water Heaters - Volume III, Volume 111, Storage Water Heaters with Input Ratings Above 75,000 Btu per hour, Circulating and Instantaneous'. Tanks must comply with SRCC OG-300 certification, if applicable, or with local codes.</p>	Capacity:	
		Manufacturer:	
		Model:	
	<p>For MF/Commercial: For two tank systems, solar tank capacity must be at least 1 gallon of storage for each collector square foot. For one tank systems, solar tank capacity must be at least 1.25 gallons of storage for each collector square foot. If solar storage capacity is not consistent with ICF but meets the sizing requirements, this is an infraction and incentive will be adjusted.</p>	Multi-Family / Commercial	
		Number of Solar Tanks:	
		Total Solar Storage Capacity:	
		Ratio of capacity (gal) to collector ft ² :	
		Is the ratio above the minimum required?:	
Waterproofing	Underground and above ground unsheltered storage tanks shall be waterproofed to prevent water seepage. Storage tanks used outdoors shall be rated for outdoor use. Controls or other weather vulnerable components shall be protected from weather effects by a shed or weatherproof enclosure.		
Operating Limits	Means shall be provided to protect the SWH system within the design limits of temperature and pressure. Limit tank temperatures to a value not to exceed the tank supplier's specified high temperature limit (unless using emergency stagnation prevention cycling.) The pressure/temperature relief valve shall not be used for this purpose under normal operating circumstances. Emergency stagnation prevention cycling is when the controller cycles the solar loop pump on and off during the day to allow the tank temperature to rise above the high temperature limit in order to prevent stagnation in the collector. The system shall be able to withstand prolonged periods of stagnation (high solar flux, no hot water demand) without significant system deterioration and with no maintenance.	<p><u>Circle applicable Stagnation Protection mechanism:</u></p> <p>Controller with vacation mode</p> <p>Controller with stagnation prevention cycling mode</p> <p>Steam back</p> <p>Heat dump radiator or convector</p> <p>Pressure Stagnation Protection</p> <p>Hartstat Thermosiphon Protection</p> <p>Swimming Pool and Spa Heat Dump</p>	

Freeze Protection Measure	<p>The following freeze protection methods are eligible:</p> <ol style="list-style-type: none"> 1. ICS. ICS can be used as the sole freeze protection method only in Climate Zones that show that lowest recorded temperature as at or above the Freeze Tolerance Limit(FTL) listed in the OG-300 system certification. 2. Thermosyphon. For thermosyphon systems, the only eligible freeze protection method is closed loop glycol. 3. Direct Forced Circulation systems(DFC), in which the domestic water is heated directly in the collector, are not eligible. 4. Indirect Forced Circulation(IFC): <ol style="list-style-type: none"> a. Glycol or other heat transfer fluids. Glycol installed per an installation manual certified by SRCC for residential systems is eligible if protected from overheat damage. Other heat transfer fluids may not be used for residential systems unless they have been certified by SRCC for the particular systems. b. Drainback systems that are properly installed. Pipe slope for gravity draining shall have a minimum 1/4 inch per foot vertical drop. c. Indirect Forced Circulation using water in the collector loop, with recirculation freeze protection, backed up by an Uninterruptible Power Supply (UPS- battery or generator). d. A conspicuous label must be placed explaining how the system is protected from freezing and what actions the homeowner should take to protect the system. <p>Closed loop recirculation systems re-circulate water in the collector loop. These systems must have a minimum of two freeze protection mechanisms on each system. Manual intervention (draining, changing valve positions, etc.) is suitable as one mechanism. At least one freeze protection mechanism, in addition to manual intervention, shall be designed to protect components from freeze damage, even in the event of power failure. For example, an Uninterruptible Power Supply (UPS) to power a freeze-protecting pump when power is lost simultaneously with freezing conditions. Freeze drain valves are not an acceptable freeze protection mechanism for these types of systems.</p>	<p>ICS: What is the FTL?</p> <p>Is this ICS system allowed in the project site climate zone?</p> <p>Thermosyphon: Is it closed loop with glycol?</p> <p>'IFC Glycol: Is there a pressure gauge showing minimum acceptable collector loop pressure?</p> <p>IFC Drainback: Is there a water level gauge or transparent in-line flow meter installed to show the water level?</p> <p>'Is there a 1/4 inch per foot vertical drop in the pipe slope, continuous with no interruption between the collector and storage tank?</p>	
Glycol systems: pressure gauge	A pressure gauge showing minimum acceptable collector loop pressure shall be provided.		
Drainback: water level gauge	<p><u>Single-Family Only:</u></p> <p>A water level gauge or a properly installed transparent in-line flowmeter shall be installed.</p>		

Protection from UV Radiation	<p>Single-Family Only:</p> <p>Components or materials shall not be affected by exposure to sunlight to an extent that will significantly deteriorate their function during their design life.</p> <p>Insulation must be protected from UV by jacketing or at least two coats of the insulation manufacturer's recommended UV coating.</p>		
Insulation	<p>For Single-Family: All interconnecting hot water piping and the final 5 feet of metallic cold water supply pipe leading to the system, or the length of piping which is accessible if less than 5 feet, shall be insulated with R-2.6 °F-ft2-hr/Btu or greater insulation. All exterior piping insulation shall be at least 3/4" thick wall, rated for the temperatures expected, and protected from UV or moisture damage. Systems with recirculation loops must insulate all accessible piping with a minimum of R2.6 value insulation. This includes the hot supply line from the auxiliary water heater to the farthest accessible point of use and the return line from the farthest accessible point of use back to the auxiliary water heater.</p> <p>For MF/Commercial: All accessible hot water piping including recirculation loops must be insulated. This includes the hot supply line from the auxiliary water heater to the farthest accessible point of use and the return line from the farthest accessible point of use back to the auxiliary water heater. Specifically, all interconnecting hot water piping and the final 1.5 meters (five feet) of metallic cold water supply pipe leading to the system, or the length of piping which is accessible if less than 1.5 meters, shall be insulated with R-2.6 degrees Fahrenheit (ft2-hr /Btu) or greater insulation. All exterior piping insulation shall be protected from ultraviolet radiation, excessive temperature, and moisture damage.</p>		
Back Thermosyphon Prevention	Means shall be provided to prevent undesired escape of heat from storage through thermosyphoning action.	Acceptable means are below (circle): Check valve Solenoid valve 18" Heat Trap	
Protection from Leaks	All piping and components must be leak free. All roof penetrations must be properly sealed or flashed and leak free. Evidence or presence of fluid or roof leaks constitutes a failure.		

<p>Water Damage</p>	<p>Collectors and support shall be installed in such a manner that water flowing off the collector surface or from the pressure relief valve shall not damage the building or cause premature erosion of the roof. Water tanks located in the living space or attic shall be installed on a drip pan with a drain line to a waste or outside or have other means to safely remove any excess liquid.</p>		
<p>Control Line and Sensors</p>	<p>All wires and connections, sensors, pneumatic lines, hydraulic lines or other means for transmitting sensor outputs to control devices shall be sufficiently protected from degradation or from introducing false signals as a result of environmental influence such as wind, moisture, temperature or other factors which may alter their intended sensing function. Weather-exposed wiring must be rated sunlight and moisture resistant and comply with NEC Articles 340 and 690. Sensor wiring shall be separated from hot collector piping and shall be protected from UV.</p>		
<p>Owner's Manual</p>	<p>An owner's manual or manuals shall be provided with each SWH system. The manual shall contain the name, phone number and address of the system supplier, the system model name or number and shall describe the operation of the system and its components and the procedures for installation, operation and maintenance.</p> <p>For Single-Family: Manuals for OG-300 systems shall be approved by the SRCC for content as described in Sections 6.6.2 to 6.6.7. This approval shall be indicated on the manuals as follows: "The solar energy system described by this manual, when properly installed and maintained, meets the minimum standards established by the SRCC. This certification does not imply endorsement or warranty of this product by SRCC." The manual shall include a comprehensive plan for maintaining the specified performance of the SWH system. The plan shall include a schedule and description of procedures for ordinary and preventive maintenance including cleaning of collector exterior surfaces. The manual shall include minor repairs and give the projections for equipment replacement. Multifamily and Commercial systems using OG-100 collectors must also have an owner's manual, provided by either the manufacturer or solar contractor.</p> <p>For MF/Commercial: The manual shall include a comprehensive plan for maintaining the specified performance of the SWH system. The plan shall include a schedule and description of procedures for ordinary and preventive maintenance including cleaning of collector exterior surfaces. The manual shall include minor repairs and give the projections for equipment replacement.</p>		

Meters	<p>For Multi-Family/Commercial Only: Installed meters must be approved for the identified metering purpose (Customer Performance Monitoring or 70/30 True up Payment). Meters must be installed properly and in the correct locations per the CSI-Thermal Metering Installation Guide</p>	Metering Purpose (circle): Opt in M&E CPM 70/30	
		Make:	
		Model:	
		Serial Number:	
		Consistent with ICF?	
		Approved for identified metering purpose?	
		Properly installed?	
INFRACTIONS			
Inspection Item	Explanation	Inspection Findings	
ICS Owner's Manual Glycol Systems Drain Back Systems	An ICS Owner's Manual shall, among normal matters, explain the owner's responsibility to drain the ICS system when the temperature may drop below the FTL. Glycol Systems Owner's Manuals shall, among other matters, recommend the next date when the glycol should be tested. Drain Back systems Owner's Manuals shall recommend regular checking by the owner of the water level.		
Shade Factor	Shade Factor must be within ± 5% of shade factor on ICF.	Shade Factor: Is shading within allowable parameters?: Is shading consistent with ICF?:	
Solar Loop Isolation	Isolation/bypass valves must be installed to allow the system owner to bypass the solar storage tank in the case of a 2-tank system, or to shut off the cold water supply to the solar tank in a 1-tank system. All isolation valves shall be labeled with their normal operating position indicated.		
Temperature Control/Mixing Valve	The system shall be equipped with a mixing valve to limit scalding temperature water to the end-users, according to manufacturer's manual. Acceptable means are: Properly installed mixing valves or ASSE anti-scald valves with a set point option appropriate for use. Other ASSE rated anti-scald valves such as point-of-use anti-scald valves.		
Pressure Relief	Each portion of the system where excessive pressures can develop shall have a pressure relief device to ensure that no section can be valved off or otherwise isolated from a relief device. Automatic pressure relief devices shall be set to open at not more than maximum design pressure, or as limited by code and shall drain to a code-approved point.		

Entrapped Air	For Single-Family Only: Suitable means of air or gas removal from all high points in the piping system and any other location where air is most likely to accumulate shall be provided. The method of removal shall be appropriate for the system type as follows: manual or automatic for closed loop (indirect) systems. Not required for integral collector storage (ICS) or drainback systems.		
Operating Indicators	The SWH systems shall include means for an observer to determine readily that the system is operating properly and providing solar heated water. As a minimum, a temperature indication is required for the solar storage tank except for passive systems.		
Fluid Safety Labeling	Labels shall mark all drain and fill valves in the SWH system. Each label shall identify the fluid in that loop. The location of fluid handling instructions shall be referenced. The label shall list the heat exchanger type and heat transfer fluid class as defined by the American Water Works Association, Cross Connection Control Manual. (Water is Class I. Propylene Glycol is Class II.) The label shall include a warning that fluid may be discharged at a high temperature and/or pressure. The label shall contain the following warning: "No other fluid shall be used that would change the original classification of this system. Unauthorized alterations to this system could result in a hazardous health condition."		
Expansion Tank	Expansion tanks shall be sized in accordance with manufacturer's instructions or ASHRAE methods. Provision shall be made to handle all fluid thermal expansion/contraction.		
Rain and Snow on Collector	The location, orientation, and position of the collector surface relative to nearby objects and surfaces shall be such that water run-off from the collector surface is not impeded nor is excessive build-up of snow on lower portions of the collector glazing permitted to occur.		
Pumps and Control	Pumps and controllers shall be appropriate for the intended use and shall be listed by recognized standards organizations.		
Water Shut-Off	For Single-Family Only: The SWH system shall be valve to provide for shut-off from the service water supply without interrupting normal cold water service to the residence.		
Service Connections and Permanent Maintenance Accessories	For Single-Family Only: Suitable connections and permanent maintenance accessories shall be provided at readily accessible locations for filling, draining and flushing liquid systems.		

Buried Components	Solar components and materials that are intended to be buried in soils shall be protected from degradation under in-service conditions to insure that their function shall not be impaired. Use proper jacketing and flashing to prevent rain penetration.		
Pipe and Component Supports	<p><u>For Single-Family:</u> Piping should be sloped toward drain ports with a drainage slope of no less than 1/4 inch per foot.</p> <p><u>For Multi-Family/Commercial:</u> Hangers shall provide adequate support and correct pitch of pipes. Hangers or supports for insulated pipes or components shall be designed to avoid compressing or damaging the insulation material.</p>		
Thermal Expansion	<u>For Single-Family Only:</u> The system design, components and subassemblies shall include adequate provisions for the thermal contraction and expansion of heat transfer fluids and system components that will occur over the design temperature range.		
Building Penetrations	<u>For Single-Family Only:</u> Penetrations of the building through which piping or wiring is passed shall not reduce or impair the function of the enclosure. Penetrations through walls or other surfaces shall not allow intrusion by insects and/or vermin. Required roof penetrations shall be made in accordance with applicable codes and also practices recommended by the National Roofing Contractor's Association.		
Pitch or Angle of Piping Installation	Piping should be sloped toward drain ports with a drainage slope of no less than 1/4 inch per foot.		
General Comments			